



INCANDESCENT

OCT 31 1941

SEARCHLIGHTS
FOR
MARINE USE



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GENERAL ELECTRIC COMPANY

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MÜNCHEN 1970
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G-E INCANDESCENT SEARCHLIGHTS FOR MARINE USE

The General Electric Company maintains one of the world's largest and best-equipped laboratories for the study of illumination and the development of lighting apparatus.

G-E marine-type searchlights—indispensable as navigational aids—are of handsome design and high efficiency, and resist the corrosive action of moist salt air.

General Electric manufactures searchlights for every purpose—standard marine use, illumination of construction work, long-distance floodlighting, spectacular displays, and aviation.

A SEARCHLIGHT is generally recognized as a necessity on every vessel, and its special value for floodlighting in case of emergency is equally understood. On a commercial vessel, its actual operation is often preceded by a long period of inactive service, during which it may have had little or no attention. For this reason, G-E marine searchlights are designed to operate properly under such conditions.

In presenting these various types of G-E marine searchlights, it is desired to emphasize certain features which have been incorporated into the design in order to meet specific operating conditions, to provide reliability, and to function properly in the hands of an unskilled operator.

On commercial vessels it has been the general practice to use either one of two types of searchlights—the commercial carbon arc or the incandescent unit, depending upon the size of the vessel and its requirements. The high-intensity searchlight is used principally in naval and military service. It is of special design and is usually provided with a signaling device and other unusual features not required for commercial applications. For this reason, a description of G-E high-intensity units is omitted.

G-E incandescent searchlights are now available with beam ratings up to 5,800,000 candle-power, and they constitute a very reliable source of effective illumination. They are easy to operate, and are turned on and off in the same manner as an ordinary electric light. The lamps are designed for a variety of voltages, and the power can be supplied from either the ship power line at 115 to 125 volts, or from storage batteries at lower voltages, as desired.

These searchlights are designed especially for power boats similar to those used by the

New York harbor police and the U. S. Coast Guard. In addition to general marine use, however, they are also applicable to the illumination of construction work, for spectacular displays, and for long-distance floodlighting.

The means used for directing the beam of light depends upon the ship's requirements and the refinements that the ship owner may wish to incorporate in the equipment. Either hand or pilothouse control can be furnished with all types.

The standard incandescent lamp sizes, and the illumination provided, are given in the table below.

G-E marine-type incandescent searchlights are made of nonferrous alloys or other rust-resisting materials to enable them to withstand severe operating conditions. They are waterproof and can be installed on the top of the pilothouse or in any other convenient location, without protection from the elements.

For many years G-E searchlights have given positive, dependable marine service because of their outstanding features. The features described in this publication refer to the heavy-duty searchlights, unless otherwise specified.

Diameter in Inches	LAMP SEARCHLIGHTS		
	Watts	Voltage	Illumination in Beam Candle- power (Approximate)
12	500	115/125	800,000
12	800	50	1,390,000
18	1000	115/125	2,200,000
18	1500	115/125	3,560,000
18	900	50	3,560,000
24	900	50	5,800,000
24	1500	50	5,800,000

Heavy-duty searchlights are available in three diameters: 12 inches (Type S-3), 18 inches (Type S-1), and 24 inches (Type S-4). An inexpensive general-purpose 18-inch searchlight known as the Type S-5 is also available. The beam candlepower varies as the square of the reflector diameter, which means that with the same lamp the 18-inch searchlight will have 2.25 times the beam candlepower of the 12-inch size, and the 24-inch searchlight will have 4 times the beam candlepower of the 12-inch.

The particular incandescent lamp used in a searchlight depends upon the type of service wanted—the burning hours, the importance of high candlepower, the beam angle, and other factors. In general, the low-voltage, short-life lamps will provide a higher beam candlepower than the longer-lived 115-volt lamps, and it may be necessary to compromise on the desired characteristics in selecting the lamp.

With the 18-inch (Type S-1) searchlight, the beam can be changed quickly from a narrow searchlight beam to a wide floodlight beam, and back again, with only a single backward or forward movement of the focusing mechanism. It can be held in either position by a positive clamping arrangement, located outside the casing.

If it is desired to operate low-voltage lamps from 110/125-volt a-c or d-c supply line, transformers or resistors for reducing the voltage can be supplied.

Each searchlight consists of a casing or barrel containing a parabolic reflector of silvered glass. The reflecting surface is protected by a heavy coating of electrolytic copper, and mechanical injury is prevented by the metal dome which forms the rear of the drum. The barrels of the Types S-1, S-3, and S-4 searchlights are made of a single casting of corrosion-resisting aluminum alloy; that of the Type S-5 is of rust-resisting sheet metal. The door is hinged to the barrel and clamped by hinged bolts with wing nuts. The front-door glass, which is heat-resisting and slightly convex, is held securely in the door frame, and all joints are made watertight by gaskets.

The barrel is mounted on a trunnion bracket which provides free movement in both vertical

and horizontal planes. These searchlights can be controlled either by hand or by a pilothouse mechanism. With the pilothouse control the barrel has a free movement of 360 degrees in the horizontal plane and from a 45-degree elevation to 35-degree depression in the vertical planes. The pilothouse control mechanism is of the lever-and-fulcrum type, of all-brass construction, and with a hollow swivel shaft.

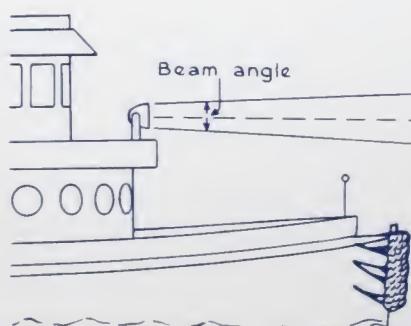
A spill-light shield, made of concentric brass rings, is attached to, and removable with, the door on the heavy-duty searchlights. The general-purpose searchlight has an auxiliary reflector which not only minimizes spill light and glare, but also adds to the beam candlepower. The projectors have a protective paint finish on all outside surfaces above the deck plates. The inside of the casing is finished with a dull-black paint. With the pilothouse-control type of mounting used on the heavy-duty searchlights, all parts of the mounting below the deck are of polished brass.

A socket for a mogul screw-base lamp is provided, and focus, with respect to the mirror, is adjusted from outside the drum.

A six-foot waterproof braided twin-conductor cable is furnished with each 12-inch searchlight.

In case it is desired to operate the lamps during battery charging, a series resistance can be furnished to compensate for the increased voltage at this time. This consists of a Nichrome-wire resistance mounted in a sheet-brass casing and is supplied when specially ordered.

The following table shows the incandescent lamps that can be used with the searchlight. For maximum candlepower it is recommended that the lamps of lower voltages be used, as in these lamps a higher concentration of filament is obtained. However, they have relatively short life; and where replacement costs must be considered, as in applications where continuous burning is necessary, lamps which have a longer rated life are recommended. The 110- to 125-volt lamps can be operated directly from standard commercial circuits, while transformers or resistances should be used for operation of the low-voltage lamps on standard circuits.



$$\frac{\text{Max CP}}{\text{Distance}(\text{ft})^2} = \text{Foot candles here}$$

$$\text{Distance in feet} \times "f" = \frac{\text{Beam}}{\text{Diam}}$$

$$\text{Beam lumens} = \frac{\text{Avg FC over}}{\text{Area}(\text{ft})} \text{ this area}$$

ILLUMINATION

INCANDESCENT LAMPS

Wattage	Voltage	Bulb	Lumens	Life	Base	Light Center in In.	Filament	Standard Package Quantity
FOR 12-INCH SEARCHLIGHTS								
500	110, 115, 120	T-20	13000	50	Medium	3	C-13	6
600	30	T-20	15100	100	Mogul	4 $\frac{1}{4}$	C-13	6
FOR 18-INCH SEARCHLIGHTS								
900	30	T-20	23500	100	Mogul	4 $\frac{1}{4}$	C-13	6
1000	110, 115, 120	T-20	27500	50	Mogul	4 $\frac{1}{4}$	C-13	6
1500	110, 115, 120	G-40	34200	200	Mogul	5 $\frac{3}{16}$	C-5	12

The following table gives the illumination produced by these searchlights with the several lamp and reflector combinations:

PHOTOMETRIC DATA ON HEAVY-DUTY SEARCHLIGHTS 18-INCH SEARCHLIGHT

CLEAR PLAIN DOOR GLASS								50° SPREADLIGHT DOOR GLASS							
Watts	Volts	Rated Life Hours	Bare Lamp Lumens	ANGLES IN DEGREES		Max C-p in Millions	Beam Lumens	FACTOR * F		ANGLES IN DEGREES		Max C-p in Millions	Beam Lumens	FACTOR * F	
				Vert.	Hor.			Vert.	Hor.	Vert.	Hor.			Vert.	Hor.
900	30	100	23500	3.9	3.6	3.56	6200	0.069	0.063	4.0	51.0	0.224	0.070	0.777	
1000	30	500	25500	4.9	4.8	2.42	6520	0.085	0.084	4.8	51.0	0.20	0.084	0.777	
1000	115	50	27500	5.1	5.5	2.2	7780	0.089	0.096	4.7	52.0	0.245	0.082	0.788	
1000	115	500	20500	6	6	1.05	5000	0.105	0.105	5.5	53.0	0.112	0.096	0.808	
1500	115	200	34200	5.6	6.7	1.9	7470	0.098	0.117	5.9	52.0	0.211	0.103	0.788	

12-INCH SEARCHLIGHT

MAZDA Lamp	Base	Volts	Bare Lamp Lumens	Beam Angle in Degrees	Max C.p. in Thousands	Beam Lumens	* Factor F
200-w., T10	Medium	115	4,250	3.3	500	658	.058
250-w., T14	Medium	115	5,600	4.4	353	970	.077
500-w., T20	Medium	115	13,000	5.0	803	2461	.087
500-w., T20	Mogul	115	(See 500-watt, T20 medium base)	4.3	1390	3030	.075
600-w., T20	Mogul	28/32	15,100				

* Beam diameter in feet on surface = distance from the surface to the projector in feet \times factor F.

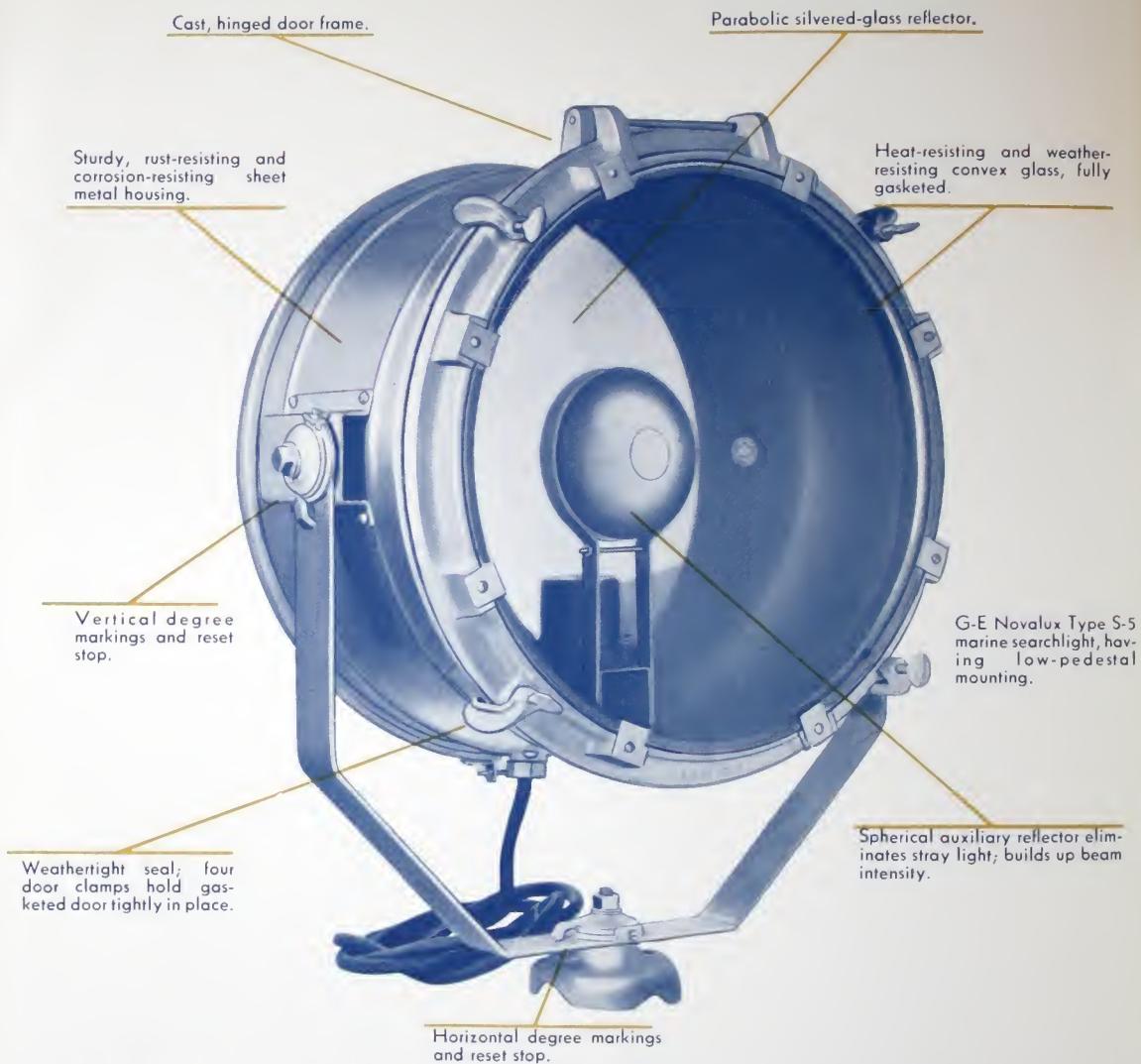
It is generally desirable to be able to forecast the lighting results which may be expected from a searchlight and to be able to compare them with the performance of other types and sizes of searchlights using various types of lamps. In this booklet you will find complete photometric data on all General Electric searchlights shown. It is not necessary to have a specialized knowledge of lighting in order to use these data; in fact, it has been so simplified that nearly anyone can forecast with accuracy the results that will be obtained.

One important thing that the user of a searchlight often wants to know is the diameter of the beam at any given distance from the searchlight. If we consider the illumination to be on a vertical plane and assume the searchlight beam to be pointed in a horizontal direction, the diameter of this circular beam pattern can be quickly determined by multiplying the distance in feet from the searchlight to the vertical surface by the factor "F." The result will be the beam diameter at this point. For example: If the searchlight is at a distance of 1000 feet from the surface to be lighted and Factor "F" is 0.070, then the beam diameter will be 70 feet.

It is usually important to know approximately what the illumination in the center of the beam at any given distance will be

in foot-candles. This figure can readily be obtained by dividing the maximum beam candlepower by the square of the distance from the searchlight to the point in question, the distance being measured in feet. For example: If a searchlight has 1,000,000 maximum beam candlepower, the foot-candle illumination in the center of the beam 1000 feet away will be 1,000,000 divided by the square of the distance (1000 feet) or one foot-candle. This, of course, assumes that there is no absorption of light because of atmospheric conditions. In haze or fog the illumination and its effectiveness are considerably decreased.

The foot-candle illumination from the above calculations will not be the uniform illumination over the beam diameter which was calculated above. Instead, it represents only the maximum illumination in the center of the beam. The average foot-candle illumination over the area of this beam can be determined by dividing the beam lumens given for the particular searchlight by the area of the beam in square feet. All of the above methods for calculating searchlight performance assume that the object is a plane surface to which the searchlight beam is perpendicular. Where this assumption is not true, the results are not accurate and a more complicated procedure must be followed.



PHOTOMETRIC DATA

Lamp Watts	Lamp Burning Position	Volts	Lamp Ordering	Rated Hours Life	Type of Base	Light Center Length (Inches)	Lamp Description	Average Beam Candle-power (Millions)	Beam Lumens	BEAM SPREAD	
										Horizontal	Vertical
900	Within 25° of Base Down	28-32	900T20P	100	Mogul Prefocus	3 ⁷ / ₁₆	Projection	3.31	5715	3.4	4.5
1000	Within 25° of Base Down	30	1M/T20/30	500	Mogul Prefocus	3 ⁷ / ₁₆	Airway Beacon	2.74	7386	4.9	4.8
1000	Within 25° of Base Down	115	1M/T20P	50	Mogul Prefocus	3 ⁷ / ₁₆	Projection	2.04	6398	5.0	5.1
1000	Base Down to Base Horizontal	115	1000/G40PSP	200	Mogul Prefocus	3 ¹⁵ / ₁₆	Spotlight	1.48	5046	5.2	5.1
1500	Base Down to Base Horizontal	115	1500G48/6	800	Mogul Screw Base	5 ¹ / ₄	Floodlight	1.27		5.2	4.4
1500	Base Down to Base Horizontal	115	1500G40/15	200	Mogul Prefocus	3 ¹⁵ / ₁₆	Spotlight	2.56	7792	5.2	5.5

Photometric data is for estimating purposes only. For laboratory test data, refer to General Electric Company.

18-INCH *general-purpose* INCANDESCENT SEARCHLIGHT

The new Type S-5 18-inch incandescent searchlight is recommended for use on barges, towboats, dredges, and other inland-waterway vessels which often find it necessary to pick up docks, shoreline and projections, channel markers, and overhead structures; and for other vessels which need a utility searchlight. This searchlight is outstanding for its lighting applications because it is more efficient and costs less than previous searchlights of this size.

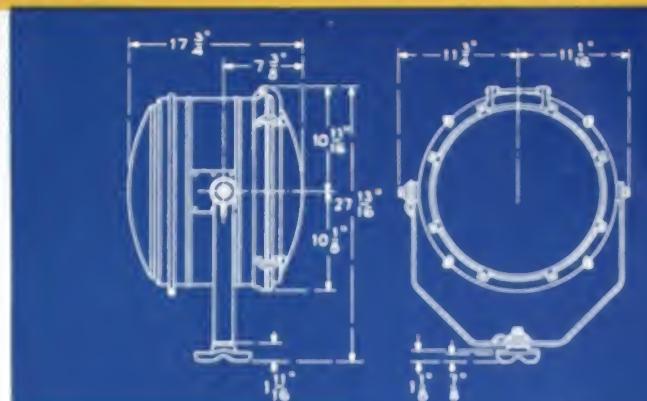
It provides a powerful, concentrated beam of light which can be directed wherever desired. In addition to its marine uses, it is recommended for furnishing protective lighting for shipyards and industrial plants.

The Type S-5 is generally used with the pilothouse control type of mounting. The searchlight is mounted on top of the pilothouse, and a control handle which permits adjustment of the floodlight beam both horizontally and vertically is located inside the pilothouse. This enables the navigator to direct the beam in wide, sweeping arcs from the same station from which the vessel is maneuvered, which is an advantage in congested harbors or narrow channels.

The housing is made of sturdy, rust-resisting sheet metal. The door frame is made of a casting and is held rigidly to the housing by means of four strong door clamps. The door, which is weathertight, is hinged at the top to facilitate lamp removal.

The unit is equipped with a fixed-position, mogul, prefocus-type lamp socket, properly adjusted at the factory for mogul-prefocus base lamps having a $3\frac{1}{2}$ -inch light-center length, and with a spacer for $3\frac{1}{2}$ -inch lamps. It can also be furnished with a mogul screw-base socket for the G-48 floodlight servicer lamp.

In addition to the pilothouse-control mounting, two other types of mounting are available—the floodlight-type base and a high pedestal base.



Outline of G-E Type S-5 18-inch incandescent marine searchlight



G-E 18-inch marine searchlight, Type S-5. For use with G-40 or T-10 bulb with mogul prefocus base. Illustration at right shows the polar-houseshoe-control lever and locking mechanism for the Type S-5 searchlight.

PRICES

Description	CARRIAGE ALLOWANCE		List Price	AMERICAN MARINE CO. INC. LTD.	
	Mogul Dynamo Base	Mogul Incandescent Base		Size	Size
Fixed floor base	A-11000	A-11000	\$100	10	100
High pedestal	A-11000	A-11000	350	10	100
Floodlight pedestal	A-11000	A-11000	350	10	100

Mogul lamp is not included in varying number of units. Please send other class numbers to change pedestal, sizes.

Other accessories for low bases. Purchased with change for 1/2 size add 25% to 50% price, or 25% for G-48, 100% for T-10, 150% for incandescent bases.



G-E Novalux, 18-inch marine searchlight, Type S-1,
having low-pedestal mounting with vertical reset stop.

G-E Novalux, incandescent, 12-inch marine searchlight,
Type S-3, with pilothouse-control mounting.

G-E Novalux, incandescent, 12-inch marine searchlight with hand-control mounting.

12-, 18-, AND 24-INCH *heavy-duty* INCANDESCENT SEARCHLIGHTS

General Electric heavy-duty searchlights are employed for marine and many industrial applications in a variety of sizes and mounting arrangements. They are being used on many types of boats and dredges as an aid to navigation and to facilitate loading. For protective lighting or night work in shipyards and ordnance plants, searchlights should be supplemented with floodlights or street-lighting luminaires.

These heavy-duty searchlights produce a high beam candlepower and a large percentage of lamp lumens is directed into the beam. This efficiency is obtained by using a high-quality silvered-glass reflector. Direct or spill light from the lamp is eliminated by the use of five concentric sheet brass cylinders or louvers. The searchlight is non-corrosive because nonferrous alloys are used throughout. It is completely waterproof in any position. The convex door glass is heat-resisting.

Three types of mountings are available. The low-base mounting for hand control is recommended only for those applications which do not require redirecting of the beam. The high-pedestal-base mounting is recommended for applications requiring frequent changes by hand. The pilothouse-control mounting is used where the searchlight is mounted in a pilothouse or guardhouse, and where the searchlight beam is to be controlled by the pilot or operator from within the house. The pilothouse-control mechanism for both the Type S-3 and the Type S-1 searchlights has a 45-degree elevation and a 35-degree depression. Both the 18-inch and the 24-inch searchlights are equipped with slip rings for 360-degree continuous horizontal rotation. The 12-inch searchlight has a fixed stop that prevents twisting the cord.

18-INCH TYPE S-1 SEARCHLIGHT

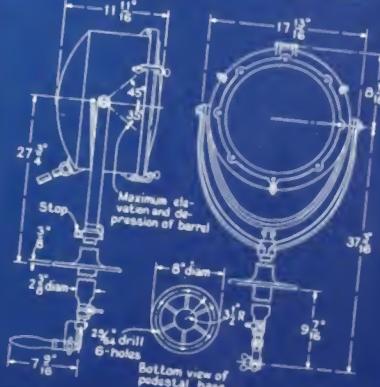
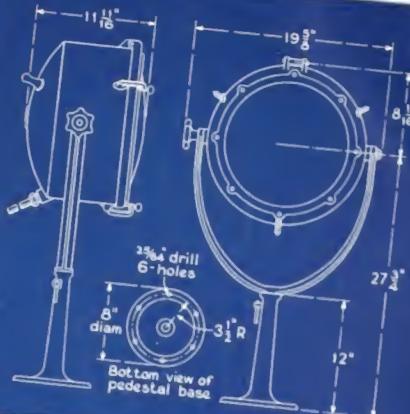


G-E 18-inch marine searchlight, Type S-1, having hand-control-type high-pedestal mounting.



G-E incandescent, 18-inch, Type S-1, marine searchlight with pilothouse-control mounting.

12-INCH TYPE S-3 SEARCHLIGHT



24-INCH TYPE S-4 SEARCHLIGHT



G-E incandescent, 24-inch marine searchlight, Type S-4, with pilothouse control.



G-E incandescent, 24-inch marine searchlight, Type S-4, with pilothouse control.

PHOTOMETRIC DATA

Searchlight	Lamp Watts	Volts	Bulb	Service	Life Hours	Lamp Lumens	Beam C-p	DEG. BEAM SPREAD		Factor "F"
								Horiz.	Vert.	
12-inch Model S-3	200*	115	T-10‡	Projection	50	4,250	500,000	3.3	3.3	0.58
	250*	115	T-14‡	Projection	50	5,600	353,000	4.4	4.4	0.077
	500*	115	T-20§	Projection	50	13,000	803,000	5.0	5.0	0.087
	500*	115	T-20§	Projection	50	13,000	803,000	5.0	5.0	0.087
	600*	28/32	T-20§	Projection	100	15,100	1,390,000	5.3	4.3	0.075
18-inch Model S-1	900*	30	T-20§	Projection	100	23,500	3,560,000	3.9	3.6	0.067
	1000*	115	T-20§	Projection	50	27,500	2,220,000	5.1	5.5	0.093
	1000*	115	T-20§	Airway beacon	500	20,500	1,050,000	6.0	6.0	0.105
	1500†	115	G-48	Floodlight	800	30,000	1,058,000			

The 24-inch searchlight has practically the same beam characteristics as the 18-inch model, except that it has approximately 1.64 higher beam candle-power.

* Base down burning only (within 25 degrees of vertical base down).

† Burn base down to base horizontal.

‡ Medium.

§ Mogul.

SPECIFICATIONS FOR HEAVY-DUTY SEARCHLIGHTS

CASING

The casing is a one-piece silicon-aluminum casting, of the cylindrical drum type, with hinges and lugs cast integral. The weatherproof enclosing door is also made of cast-aluminum alloy.

DOOR GLASS

The convex door glass for this searchlight is heat-resisting and has the over-all diameters given below for each of the three sizes.

REFLECTOR

The parabolic silvered-glass reflector is accurately ground and polished, and is furnished with a durable protective backing. The effective reflector diameters for these searchlights is given in the table below.

OVER-ALL DOOR-GLASS DIAMETERS

Type	Size in Inches	Diameter in Inches	Cat. No.
S-3	12	13 $\frac{1}{4}$	4865012G1
S-1	18	19 $\frac{3}{16}$	4830575G1
S-5 (general-purpose)	18	18	5562041G1
S-4	24	25 $\frac{1}{8}$	5562363G1

LAMP SOCKETS

Unless otherwise requested, the lamp socket in these searchlights is of the mogul screw-base type. A G-E 070 adapter is furnished with the 12-inch size to accommodate medium screw-base lamps.

LIGHT SHIELD

Concentric sheet-brass cylinders, black oxidized, and rigidly fastened to the door, are provided to minimize glare resulting from direct or spill light.

MOUNTINGS

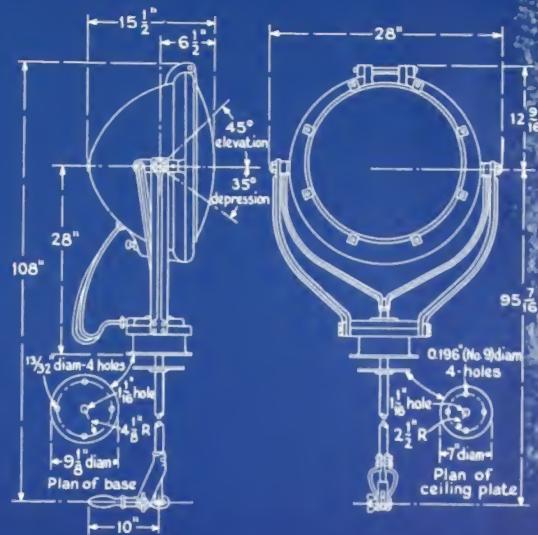
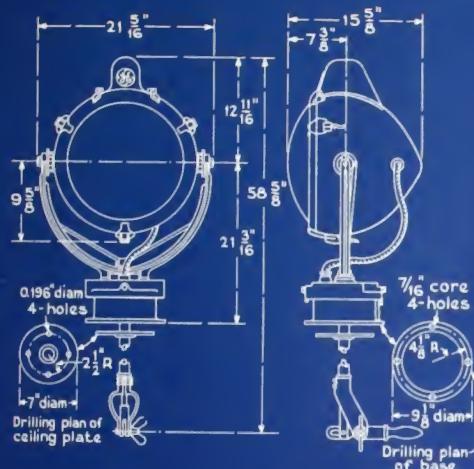
Three types of mountings are available for this heavy-duty searchlight. See descriptions and recommendations on page 9.

EFFECTIVE REFLECTOR DIAMETERS

Type	Size in Inches	Effective Diameter in Inches
S-3	12	12 $\frac{1}{4}$
S-1	18	19 $\frac{7}{16}$
S-4	24	25 $\frac{1}{4}$

G-E FLOODLIGHTS

WITH PILOTHOUSE CONTROL



Vessels of all types, including barges, dredges, cargo, and other commercial crafts and shipyard and other industrial protective and yard lighting, frequently require a wider beam of light than can be obtained with an incandescent searchlight.

For applications which require redirecting of the beam from the pilothouse or the guard tower, these G-E Novalux floodlights with pilothouse-control mounting provide excellent lighting. They can be furnished for use with either a floodlight-service or general-service lamp. When equipped with the floodlight-service lamp, these projectors have a beam as narrow

as 12 degrees, and with the general-service lamp, as narrow as 23 degrees. By using stippled or spreadlight lenses, this beam can be widened to as much as 67 degrees.

The Type L-31 floodlight (above, left) has a durable housing of die-formed sheet copper, and the Type L-34 floodlight (above, right) is made of cast aluminum. All reflectors are of silvered glass with an improved fire-enamelled porcelain backing to protect the silver.

Floodlight prices and photometric data will be furnished upon request.

PRICES

Model	Last Price	Mazda Lamp Wattage	Mounting
12-inch A155G1 A155G1	\$160 200	200 w T-10, 115 v projection 250 w T-14, 115 v projection 500 w T-20, 115 v projection 600 w T-20, 28-32 v projection	Hand control, high base Pilothouse control
18-inch A151G1 A151G2 A151G3 A151G5	430 395 350 330	900 w T-20, 28-32 v projection 1000 w T-20, 30 v beam 1000 w T-20, 115 v projection 1000 w G-40, 115 v spreadlight 1300 w G-48, 115 v spreadlight 1500 w G-40, 315 v projection	Pilothouse control, with lamp Pilothouse control, with lamp Hand control, high pedestal Hand control, low base
24-inch	Prices on Application		
Prices and other data subject to change without notice.			Pilothouse control Hand control, high pedestal Hand control, low base

GENERAL  ELECTRIC
SCHENECTADY, N.Y.